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Seed analyst. See story on page 31.

Analyste des semences. Voir texte en page 31.

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HOE-GRASS, A NEW HERBICIDE FOR WILD OATS

H. A. FRIESEN

La folle avoine est peut-être la mauvaise herbe annuelle qui coûte le plus cher aux céréaliculteurs de l'ouest du Canada. Les chercheurs ont donc ardemment cherché à mettre au point un herbicide capable de la combattre avec efficacité et d'atténuer les pertes qui en résultent. Le présent article examine l'application et l'efficacité de Hoe-Grass, herbicide de post-levée destiné à combattre la folle avoine et la sétaire; ce désherbant, recommandé par le Comité canadien de malherbologie (Section de l'Ouest), devrait être homologué à temps pour permettre au moins des ventes limitées en 1976.

Wild oats is possibly the most costly annual weed that western Canadian grain farmers must contend with. Consequently scientists have eagerly searched for a herbicide that will effectively control it and offset those losses.

Twenty years ago the idea of selectively killing wild oats growing in cereal crops seemed very remote because all are members of the grass family. Although cultural practices are useful, their effectiveness is often hampered by weather. The practice of delayed seeding depends on weather and, to be successful, also requires an early maturing — and consequently lower yielding — variety of barley. Weed surveys have shown that in the period from 1932 to 1965 cultural practices enjoyed only limited success in ridding western Canada of wild oats.

The need for help in the form of selective chemicals has been recognized for many years. In 1960 the first truly selective herbicides, under the trade names Avadex (diallate), Avadex BW (triallate), and Carbyne (Barban), were used by farmers to control wild oats in wheat, barley, and flax.

Shortcomings in each of these herbicides were spotted in early testing and confirmed by use in farm fields. A continuous effort has been made, therefore, to improve existing herbicides and to develop new and better materials to meet the needs of farmers.

Treflan (trifluralin) for use in rapeseed and Asulox F (asulam) for use in flax were soon added to the chemical arsenal. Endaven (benzoylprop ethyl), selective in wheat, and Avenge (difenzoquat), selective in barley, are very recent additions. The latter two herbicides largely overcome the need to spray during the 2-leaf stage, a major drawback for the successful use of Carbyne. However, control with Endaven in the early stages (2-3 leaf) may be disappointing. Spraying later to ensure a high degree of control could require sacrificing some wheat yield due to longer crop–weed competition.

The latest arrival and one of the most promising is Hoe-Grass (HOE 23408) because it is effective against a wider range of grassy

Figure 1. Note the excellent control of wild oats in wheat (stake in middle of plot) after application of Hoe-Grass at 1 lb/ac (1.1 kg/ha) when the weed was in the 3-leaf stage.

H. A. Friesen is a weed control specialist and Head of Crop Management and Soils at CDA Research Station, Lacombe, Alta.

Figure 2. Hoe-Grass does not control broadleaf weeds. Note the survival of tartary buckwheat after application of 1 lb/ac (1.1 kg/ha) of the herbicide (stake in middle of plot).

weeds and tolerated by more kinds of crops.

Hoe-Grass is a post-emergence chemical that kills both wild oats and green foxtail. Applied to the midpoint of the first, second, third, or fourth leaf of different wild oat plants, it resulted in mottling and gradual death of the leaf portion above but not below the point of application. This indicated that the chemical moved primarily in an upward direction in the plant. Applied at or below the stem apex (i.e., at the crown node just above the soil line), Hoe-Grass rapidly killed the treated area and eventually, the entire plant. Because the stem apex area is usually not more than 2 cm (¾")above the soil surface and the chemical does not move downward in the plant, thorough spray coverage of the entire plant is essential.

Adjuvants, such as Rennex 36, a wetting agent, have markedly enhanced the wild-oat killing power of Hoe-Grass presumably due to greater penetration. The activity of this herbicide was greater on green and yellow foxtail, in that less material was required to achieve control comparable to that of wild oats. The former are fairly widespread and troublesome weeds in grain crops. Radioactive Hoe-Grass is being used to study its penetration, translocation, and fate in the plant in greater depth.

Wheat (spring and durum), flax, and rapeseed have shown very high tolerance to this chemical. The tolerance of barley has not been clearly established. In barley, the foliar applications tended to inhibit shoot and crown-root development. The shoots suffered mottling and growth suppression. In most 6-row barley cultivars this effect was temporary and the plants recovered in 2–3 weeks. The 2-row cultivars did not fully recover from the treatment, especially if treated prior to the 4-leaf stage. Crown-root development was inhibited in both 6- and 2-row barleys and the plants did not replace these roots. In the 6-row cultivars at least, the loss in root development did not appear to suppress the grain yield seriously. By proper use of adjuvants, a formulation of Hoe-Grass can probably be developed that will be completely safe to use on barley.

Hoe-Grass, applied in soil (especially when worked into the upper 2–3 in. of the soil), has shown some activity against wild oats and green foxtail. The activity via the soil, however, is so much less than if the compound is applied to plant foliage that study of this aspect has been discontinued.

No harmful residues were found in soil from fields treated the year before with Hoe-Grass at rates somewhat higher than that recommended for wild oats.

For greatest efficacy of wild oats control and for greatest enhancement of crop yield, the Hoe-Grass should be applied when most wild oats are in the 2-leaf or 3-leaf stage and actively growing. Treatment of the wild oats before they have tillered is preferred. Spraying later during the 4-leaf and 5-leaf stages will somewhat reduce weed control and crop yield. Hoe-Grass should be sprayed at 16 oz/ac of active ingredient (40 oz/ac or 2.80 kg/ha of actual product) in 10 gal of water (1.1 kg in 110 litres/ha). To effect the best coverage, the spray pressure should be 40 psi (275 kPa); the ground speed 4–5 mph (6.4 to 8.0 km/h), and the spray boom tilted forward at a 45° angle. Rain within four hours after spraying could result in significant loss of chemical.

Where green and yellow foxtail and barnyard grass but *not* wild oats are the weeds to be killed, the dosage of Hoe-Grass can be reduced to 12 oz/ac (0.82 kg in 110 litres/ha) of active ingredient (33 oz/ac or 2.30 kg/ha of product). Hoe-Grass does not control any of our troublesome broadleaf annual weeds.

Wheat, rapeseed, mustard, and flax have shown high tolerance to Hoe-Grass at the above rates in extensive field tests throughout western Canada. However, some of the 6-row and especially the 2-row cultivars of barley treated during the early 2-leaf to 3-leaf growth stages suffered suppression of growth and significant losses in yield. Current research into the use of spray adjuvants suggests that very much lower rates of Hoe-Grass may be

possible for equally good wild-oats control. The possibility of developing an improved formulation of Hoe-Grass that will give good wild-oats control and not adversely affect barley appears highly probable.

Combining two wild-oats herbicides can have synergistic, additive, or antagonistic effects. Experimental studies to date suggest that the effect may be more than simply additive, that is, the effect may be synergistic when rather low dosages of Avenge and Hoe-Grass are combined. Such a combination, however, is still a long way from being a practical reality.

Because Hoe-Grass does not control broadleaf weeds, interest in possible combinations with herbicides that do control these species is high. Unfortunately, the early results are not encouraging. The herbicidal activity of Hoe-Grass was severely reduced when mixed in the same spray tank with growth hormone type herbicides like 2,4-D, MCPA, and dicamba. Ester formulations of 2,4-D and MCPA were less antagonistic in these mixtures than were the amine formulations. The antagonism was due to the active ingredient in these compounds rather than the solvent incompatibilities. Fortunately, Hoe-Grass did not adversely affect the activity of the hormone type broadleaf weed killers when applied as tank mixtures. Buctril (bromoxynil), a non-hormone broadleaf herbicide, did not appreciably reduce the wild oats control when used in a mixture with Hoe-Grass. Bromoxynil, however, is usually marketed as a (1:1) mix with an MCPA ester under the trade names of Buctril M and Brominil M because alone its range of high efficacy is limited to the buckwheats and smartweeds. Buctril M and Brominil M have been measurably less antagonistic to Hoe-Grass than 2,4-D or MCPA. Mixtures of Hoe-Grass with other non-hormone broadleaf herbicides like Stam (propanil) or Sencor (metribuzin) appear promising in preliminary experiments.

CAUTION. At the present time mixtures of Hoe-Grass with any broadleaf herbicides are *not* recommended and will result in reduced wild-oats control. After application of Hoe-Grass, a time interval of four days is required before broadleaf herbicides can be applied without a reduction in wild-oats control. ■

NOTICE

Hoe-Grass has been recommended for the above uses based on its performance in test plot experiments by the Canada Weed Committee (Western Section). To this date, however, it has *not* been formally licensed for farm use. It is anticipated that it will be licensed in time to permit at least limited sales in 1976.

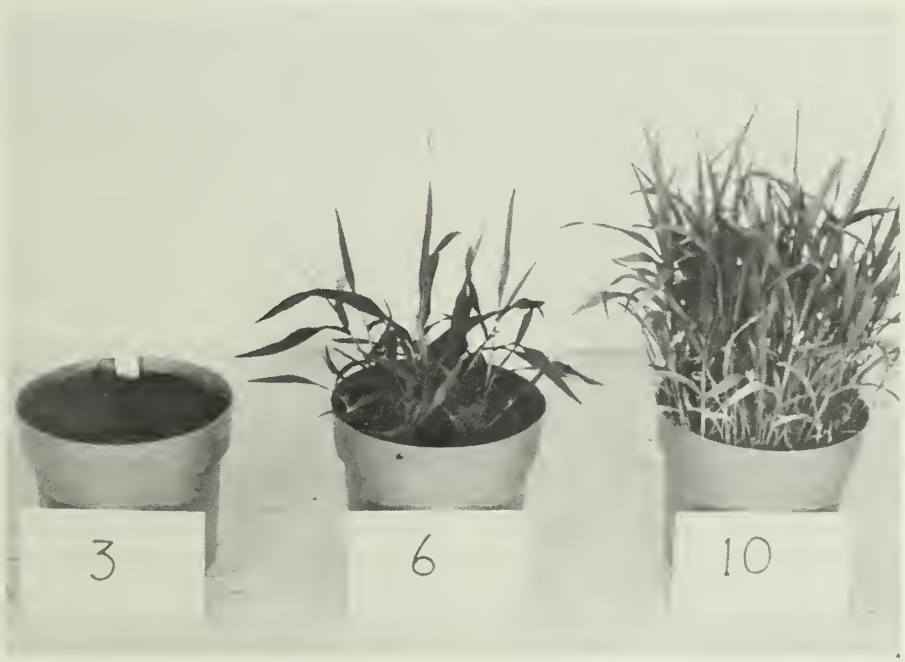


Figure 3. Note the complete kill of green foxtail in pot 3 after application of 12 oz/ac (0.82 kg/ha) of Hoe-Grass. Approximately 15% of the weeds in pot 6 survived the chemical applied at 8 oz/ac (0.56 kg/ha). Pot 10 is untreated green foxtail.

NEW SEED-BORNE VIRUS OF FIELD PEAS

R. C. ZIMMER and
S. T. ALI-KHAN

A new virus disease of field peas has been detected in Canada. The disease was first spotted in December, 1974 in advanced breeding lines of field peas developed by CDA Research Station, Morden, Manitoba and the Crop Development Center of the University of Saskatchewan.

The new disease, pea seed-borne mosaic virus (PSbMV), is potentially serious because it spreads easily. The virus can be carried by the seed and transmitted by aphids. Even if only a low percentage of seed in a field is infected, a buildup of aphids could cause the disease to sweep through the field and flare up in adjacent fields. In this way, the virus can quickly spread over great distances.

Prompt action is needed to control the disease. Many people are helping: scientists from CDA Research Stations at Vancouver, Morden, and Winnipeg; researchers from the University of Saskatchewan; experts from CDA Plant Product and Plant Protection Divisions in Ottawa; and the Canadian Seed Growers' Association. Their first task was to find out to what extent PSbMV had infected pedigreed and commercial seed and the lines of the two field-pea breeding programs.

At Morden, we checked 1,235 breeding lines in the greenhouse and in the field by visual and plant indicator studies; about 9 per cent of the lines were infected.

After the virus was found in both Canadian breeding programs on field peas, commercial seed was checked. Initially 100 samples of commercially grown field peas were collected, mainly from the Prairies, and sent to the CDA Research Station at Vancouver to be examined by the virologist, Dr. R. I. Hamilton; 9 samples had from 1 to 2 percent of seed infected. A second group of 91 samples, these from eastern Canada, have been evaluated; 6 samples contained from 1 to 2% of infected seed.

The disease is not unknown. It was reported in Japan in 1967, in the U.S. in 1968, in the Netherlands, and in Czechoslovakia. We can learn much about the disease from the U.S. research.

Fababean variety 'Ackerperle'. The plant on the left is healthy. The plant on the right, inoculated with extract from PSbMV-infected plant, is stunted; the upper leaves are distorted and chlorotic.

Variété «Ackerperle» de la féverole. Le plant de gauche est sain. Celui de droite, inoculé avec un extrait provenant d'un plant infecté par le virus de la mosaïque est rabougri, les feuilles supérieures sont déformées et chlorotiques.

According to a host-range study, 47 species representing 12 families in the dicotyledonous plant group can be infected with PSbMV when inoculated by mechanical means or by aphids. Although many species of *Chenopodiaceae* and *Leguminoseae* are susceptible, the most vulnerable are peas, sweetpeas, fababeans, and lentils. Three aphid species capable of transmitting the virus were identified: pea, green peach, and potato aphids.

The visible effect of the disease on plants is well documented. In the field, an affected plant displays stunted growth, rosetting, downward lateral leaf roll, and ovular abortion that results in reduced

Dr. Zimmer is a plant pathologist and Dr. Ali-Khan is a field pea breeder at the CDA Research Station, Morden, Man.

LUTTE CONTRE UN NOUVEAU VIRUS DES POIS

R. C. ZIMMER et
S. T. ALI-KHAN

Une nouvelle virose des pois de grande culture a été dépistée au Canada. Elle a été pour la première fois localisée en décembre 1974 dans les lignées préliminaires de pois de grande culture obtenues à la Station de recherche fédérale de Morden (Manitoba) et au Centre de développement des cultures de l'université de la Saskatchewan.

La nouvelle maladie, un virus de la mosaïque du pois transmis par les semences, est virtuellement grave parce qu'elle se propage facilement. Le virus peut être porté par la semence et transmis par les pucerons. Même si le pourcentage de semences infectées dans un champ est faible, une forte population de pucerons peut la répandre sur toute la superficie et la disséminer dans les champs adjacents. De cette façon, le virus se propage rapidement sur de grandes distances.

Il est nécessaire de prendre immédiatement des mesures afin de lutter contre cette maladie. Beaucoup de personnes y contribuent: les chercheurs des stations de recherches de Vancouver, Morden et Winnipeg; les chercheurs de l'université de la Saskatchewan; les experts de la Division des produits végétaux et de la Division de la protection des végétaux d'Agriculture Canada (Ottawa); et l'Association canadienne de producteurs de semences. Leur première tâche a été de découvrir jusqu'à quel point le virus de la mosaïque a infecté les semences généalogiques et commerciales et les lignées des deux programmes de sélection de pois de grande culture.

A Morden, nous avons examiné 1235 lignées dans les serres et dans les cultures (études visuelles et de plantes indicatrices); environ 9% des lignées étaient infectées.

Après la découverte du virus dans les deux programmes canadiens de sélection de pois de grande culture, les semences commerciales ont été

Le Dr Zimmer est phytopathologiste et le Dr Ali-Khan, sélectionneur de pois de grande culture de la Station de recherche de Morden, Manitoba, Agriculture Canada

Lésions locales sur une feuille de la plante indicatrice de lésions locales *Chenopodium amaranticolore*.

Local lesions on a leaf of the local-lesion indicator plant, *Chenopodium amaranticolor*.

yields. (The term 'fizzle-top' has been coined to describe the appearance of a severely infected pea plant.)

The disease can be detected visually with good accuracy on juvenile plants growing in the greenhouse. These plants are characterized by the downward lateral leaf roll, vein banding, and dwarfing.

Visual detection can be confirmed on the local lesion host *Chenopodium amaranticolor* and on the systemically infected assay hosts *Vicia faba* (fababean) and Perfection-type pea '447'. Also, serology and electron microscopy are being used to confirm the presence of PSbMV.

We are learning how far and how fast the disease has spread and the extent of the losses caused by it. This is only the first step.

We must eradicate the disease and prevent its recurrence in Canada. To help in this work, we are seeking a quick and reliable method of identifying the disease.

The most time-consuming task will be ridding stocks of infection. All seed on an infected plant may not contain the virus. We shall have to apply vigorous testing and selection methods for up to four years to ensure that seed lines and other stocks are free from disease.

For long-term control, we may be able to breed stock more resistant to the disease. ■

examinées. D'abord, 100 échantillons de pois en culture commerciale ont été prélevés, principalement dans les Prairies, et envoyés à la Station de recherche de Vancouver où ils ont été examinés par R. I. Hamilton, virologiste; dans 9 échantillons, de 1 à 2% des graines étaient infectées. Un deuxième groupe composé de 91 échantillons, provenant de l'est du Canada, a été évalué; 6 échantillons contenaient de 1 à 2% de graines infectées.

Cette maladie n'est pas inconnue. Elle a d'abord été signalée au Japon en 1967 puis aux Etats-Unis en 1968, en Hollande ainsi qu'en Tchécoslovaquie. Les recherches américaines nous fournissent beaucoup de renseignements au sujet de cette maladie.

D'après une étude des plantes hôtes poussant en parcours, 47 espèces représentant 12 familles appartenant au groupe des plantes dicotylédones peuvent être infectées, par le virus de la mosaïque, lorsqu'elles sont inoculées par des moyens mécaniques ou des pucerons. Même si beaucoup d'espèces de chénopodiacées et des légumineuses sont sensibles, les pois, les pois de senteur, les féveroles et les lentilles sont les plus vulnérables. Trois espèces de pucerons, capables de transmettre le virus, ont été identifiées: le puceron des pois, des pommes de terre et des pêches vertes.

La documentation sur les effets visibles de cette maladie sur les plantes est abondante. Dans les champs, un plant infecté se caractérise par une croissance au ralenti, des rosettes, l'enroulement vers le bas des feuilles latérales, et un rachitisme ovulaire qui provoque une diminution du rendement. (Le terme «extrémité crêpée» a été inventé pour décrire l'apparence d'un plant de pois gravement infecté.)

Lignee 447 de pois de transformation Le plant de gauche est sain Celui de droite, inoculé avec un extrait provenant d'un plant infecté par le virus de la mosaique, est rabougri, les feuilles supérieures sont plus petites, compactes et présentent un enroulement vers le bas des feuilles latérales

Cette maladie peut être détectée visuellement, avec précision, sur les plants cultivés en serre. L'enroulement vers le bas des feuilles latérales, le liséré des nervures, et le nanisme caractérisent ces plants.

La détection visuelle peut être confirmée par les lésions locales produites chez l'hôte *Chenopodium amaranticolore*, chez les hôtes d'essai *Vicia faba* (féverole) infectés par voie systémique et sur la lignée de pois «447» du genre Perfection. La sérologie et la microscopie électronique sont aussi utilisées pour confirmer la présence du virus de la mosaïque.

Nous connaissons jusqu'à quel point et à quelle vitesse la maladie se propage ainsi que l'ampleur des pertes qu'elle cause. Ce n'est que la première étape de la lutte.

Nous devons éliminer cette maladie et empêcher qu'elle se répète au Canada. Afin de faciliter ce travail, nous cherchons une méthode rapide et sûre qui nous permettra de l'identifier.

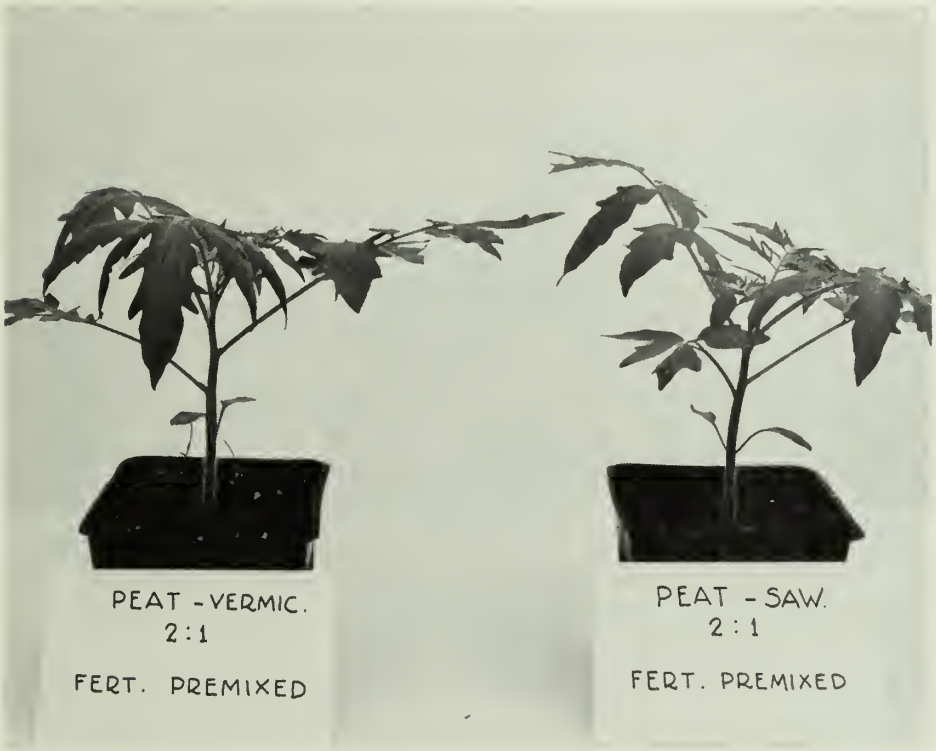
L'élimination de l'infection des stocks sera des plus fastidieuses. Toutes les graines d'un plant infecté peuvent ne pas contenir le virus. Nous devrons effectuer des essais rigoureux et appliquer des méthodes de sélection pendant au moins quatre ans afin de garantir que les lignées de semence et les autres stocks sont exempts de cette maladie.

A long terme, nous pourrons peut-être parvenir à sélectionner des stocks plus résistants à la maladie. ■

RAISING TOMATO PLANTS WITHOUT SOIL

R. M. ADAMSON and
E. F. MAAS

Les serristes de la région du littoral de la Colombie-Britannique découvrent les avantages de la culture des tomates sur substrat inerte: en effet, on peut ainsi accroître les rendements affaiblis par la dégradation du sol ou par la multiplication des micro-organismes pathogènes et des nématodes telluriques; les plants reviennent moins chers à cultiver s'ils sont enracinés dans des substrats de multiplication plus légers que le sol; finalement la qualité et l'uniformité des cultures ont tendance à être plus constantes puisque les composants des substrats inertes varient très peu d'une année à l'autre. On peut se procurer les renseignements sur cette nouvelle méthode de culture en s'adressant aux Stations fédérales de recherches agricoles de Sydney et d'Agassiz.



Vendor tomato plants grown in a 2:1 peat-vermiculite mixture, left, and 2:1 peat-sawdust mixture, right, with all fertilizers, mainly slow-release pellets, premixed with the growing medium before the seedlings were planted, and only water supplied subsequently.

Raising well grown, stocky transplants is important in any successful tomato production. Such plants can be produced readily in soilless mixtures, rather than in soil. This method, however, is of special importance to the substantial and increasing numbers of greenhouse growers in coastal British Columbia who produce their crops in sawdust.

- Plants are cheaper to handle when rooted in soilless propagating mixtures, which are lighter in weight than soil.
- Because the ingredients of soilless media vary little from season to season, the plants tend to show a more consistent quality and uniformity.
- There is less likelihood of the sawdust into which the plants are transplanted becoming decomposed than if plants are raised in soil.
- Plants raised in soilless mixtures develop more quickly, permitting a delay in sowing the early crop, with some savings in fuel costs.

CDA researchers at Sidney, B.C. have consistently produced high quality transplants by sowing seed into a 1:1:1 mixture of medium sand, perlite, and finely ground sphagnum peat and pricking out the seedlings (usually from 2 to 3 weeks after sowing) into a 2:1 mixture by volume of horticultural grades of sphagnum peat and vermiculite. They have also used sawdust successfully in place of vermiculite. Sawdust is not as absorbent as vermiculite, but is less expensive; moreover, sawdust is usually available while vermiculite is sometimes hard to obtain. To each cu ft of the peat-vermiculite or peat-sawdust mixture, add 2 oz (to each 100 litres add 200 g) of hydrated lime in order to adjust the pH and supply calcium.

R. M. Adamson is a specialist in weed control and vegetables at the CDA Research Station, Sidney, B.C. and E. F. Maas is a specialist in plant nutrition and non-soil media with the CDA Research Station, Agassiz, B.C.

Commercial greenhouse on Vancouver Island where tomatoes are grown in soilless media

Growers using soilless media must supply the plants with all nutrients in the proper proportion. The Research Station at Sidney suggests this formula:

	Amounts for dilute solution per 100 gal	per 100 litres
Potassium chloride (0-0-60)	6.7 oz	42 g
Magnesium sulphate (Epsom salts)	8.0 oz	50 g
Diammonium phosphate (21-53-0)	2.5 oz	16 g
Calcium nitrate (15.5-0-0)	9.7 oz	60 g
Minor element solution[1]	3.3 fl oz	21 ml

For the period from sowing to pricking out, a single preliminary soaking only, with this solution at half strength, is frequently sufficient. Subsequently, the full strength dilute solution is applied periodically to the growth mixture when moisture is needed by the plants.

Or the nutrients, mainly in the form of slow-release pellets, can be mixed with the growth mixture before pricking out. With this method, after the seedlings are pricked out, the grower does not have to apply any further nutrients. All the plants will require until they reach transplanting stage are adequate light, water, and heat. For this premix method, the Research Station at Sidney uses this formula:

	Amounts in growth mixture per cu ft	per 100 litres
Mag-Amp (7-40-6)	6.0 oz	600 g
Osmocote (18-6-12)	3.0 oz	300 g
Osmocote (14-14-14)	1.5 oz	150 g
Minor element solution[1]	0.5 fl oz	50 ml

The minor element solution is the same for both the dilute solution and premix formulas. To prepare the solution, dissolve 370 g of dry minor element mix in 5 litres of water. The 370 g of dry minor element mix contain 63 g boric acid, 72 g manganese sulphate, 11 g zinc sulphate, 3 g copper sulphate, 1 g molybdic acid, and 220 g ferric citrate ■

MANAGING ALFALFA FOR BETTER PROFITS

L. D. BAILEY

La luzerne peut être l'une des cultures les plus rentables pour l'agriculteur. Elle surpasse en effet les autres cultures fourragères en rendement de matière sèche, de protéines, d'éléments énergétiques nets, par l'acceptation du bétail et les revenus d'investissements. Si l'agriculteur ne tire pas de bons revenus de cette culture, c'est probablement que le régime d'exploitation laisse à désirer. La Station fédérale de recherches agricoles de Brandon recommande de meilleures méthodes de production de la luzerne au Manitoba et partout où cette plante est cultivée.

Alfalfa can be one of a farmer's most profitable crops. Tests at CDA Research Station, Brandon, Manitoba over a period of years demonstrate that alfalfa is the king of the forage crops: it is superior in yield of dry matter, protein, net energy, acceptance by livestock, and return on money invested.

If a farmer doesn't realize good returns on this crop, probably poor management is the culprit. You can't just sow the seed for alfalfa or any forage crop — and then sit back until harvest time.

Good management is the key to high yields of quality alfalfa. Our research indicates that the following procedures will help growers to produce alfalfa better in Manitoba or wherever alfalfa is grown.

Alfalfa can be grown on any soil with good drainage. The best yields are obtained from deep, well-drained soils ranging in texture from a sandy loam to clay. Coarse textured soils (sands) don't usually provide enough moisture; however, if you apply adequate fertilizer, you can get good yields on sand associated with high water tables or located in areas of high rainfall.

Alfalfa has some tolerance for soil salinity (4–8 mmhos/cm) while the stand is being established; this tolerance increases in time, particularly if the crop is getting adequate nutrients.

Alfalfa grows best on soils with a pH above 6.5. Liming is therefore not usually needed in Manitoba where most soils have a pH greater than 7.0. Lime should be applied, however, prior to seeding if the soil test indicates a pH of less than 6.5.

Varieties of alfalfa are available for pasture (creeping types) and for hay (upright types). Each variety has unique characteristics relating to type and also to suitability to soil, climatic, and management conditions. Carefully consider these characteristics in selecting a variety.

To ensure varietal identity and purity, buy pedigreed seed, that is, foundation or certified seed. The seed should be inoculated with the inoculant recommended for your area. You can obtain information on varieties and inoculants suitable for your area from seed houses and from federal and provincial Departments of Agriculture.

Prepare a seedbed firm and free of clods. This will make it easier to sow the seed to a uniform depth of less than 1 in. (2.5 cm) and will ensure that the seed is in close contact with soil and moisture. Do not sow a companion crop with alfalfa because it increases the possibility of a serious weed problem, particularly in the first year of establishment. You can obtain current information on weed control from the federal and provincial Departments of Agriculture.

Sow the seed in May or in the last half of August. A May seeding usually results in a better stand; and if the crop receives enough moisture and fertilizer, it can be harvested in August. Do not seed alfalfa and fertilizer in the same row. Fertilizer may be banded or broadcast prior to seeding.

Alfalfa uses a large quantity of all plant nutrients (Table 1). The higher the yield, the larger the quantity of plant nutrients removed from the soil (Table 2).

Tests at the Research Station, Brandon, Manitoba confirm the need for adequate soil fertility. Over a 6-year period, fertilized alfalfa plots consistently yielded better than check plots (Table 4).

If potassium was not applied, winterkill struck plants grown on soils having less than 250 kg/ha K in the top 30 cm; the potassium content of these plants was generally 1% or less. Plants were also winterkilled when grown on soil with less than 10 kg/ha of available phosphorous and less than 5.6 kg/ha of available sulphur; these plants had a phosphorous content of 0.15% or less and the sulphur content was equally low.

To avoid winterkill and to improve plant yields and quality, the elemental composition of the crop should exceed 3.0% for nitrogen, 0.20% for phosphorous, 2.0% for potassium, and 0.20% for sulphur. You can be sure of obtaining this composition by applying fertilizer in accordance with the following program.

Have the soil tested to determine what nutrients are needed. Apply phosphorous if less than 22.4 kg/ha

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are available in the top 30 cm of soil. Apply potassium if less than 672 kg/ha are available in the same soil depth. You should also apply sulphur if less than 16.8 kg/ha SO_4–S are available in the top 15 cm of soil.

You do not usually have to supply nitrogen because the plant obtains it symbiotically. Check periodically, however, to see that the roots of the plants contain nodules. You can be sure that nitrogen fixation is taking place if the large nodules are bright pink when cut open. An old stand of alfalfa, where plant population is very low, may respond to a single, low-rate application of nitrogen fertilizer, but repeated nitrogen applications will reduce the stand.

Alfalfa does not respond to applications of micronutrients. If micronutrients are applied either as a foliar spray or as a soil dressing, however, this will usually increase the uptake of nutrients. Applying copper and molybdenum helps to increase the percentage of nitrogen in the crop.

Manitoba growers of alfalfa can aim at a two-cut system with a total yield (Table 4) of 8 960–11 200 kg/ha (4–5 tons/ac). Harvest the crop at the early bloom stage of growth when food value and mineral content are high (Tables 1 and 2).

If harvest is delayed, several problems occur: (i) the forage is woody and more leaves are lost during the curing and haying processes; (ii) the food value and mineral content of the plant decrease (Table 3); and (iii) in Manitoba, moisture is generally low in July and August; if a crop is harvested in July, regrowth is slow and the second cut must be delayed to September — by which time grain is being harvested and a second cut may not be taken. ■

TABLE 1 YIELD AND CHEMICAL COMPOSITION OF ALFALFA HARVESTED OVER A 6-YEAR PERIOD (AVERAGE OF 7 LOCATIONS).

Treatments	Cuts	Yield kg/ha	Percent				ppm	
			N	P	K	S	Cu	Mo
Check	1	4052	2.80	0.20	2.10	0.18	6	3.1
Check	2	2077	2.05	0.17	1.95	0.15	6	3.3
Fertilized[1]	1	5600	3.50	0 25	2.50	0 25	8	3.6
Fertilized[1]	2	4480	3.25	0.20	2.45	0 20	8	3.6

[1]Plots received annually as a spring broadcast application 67 kg/ha P_2O_5, 112 kg/ha K_2O, and 23 kg/ha S.

TABLE 2 PLANT NUTRIENTS REMOVED FROM THE SOIL BY ALFALFA (ANNUAL AVERAGE).

Treatments	Cuts	Yields kg/ha	kg/ha			
			N	P	K	S
Check	1	4052	113.46	8.10	85.09	7 29
	2	2077	42.58	3.53	40.50	3.12
Total		6129	156.04	11 63	125.59	10.41
Fertilized[1]	1	5600	196.00	14.00	140.00	14.00
	2	4480	145.60	8.96	109.76	8 96
Total		10080	341.60	22 96	249 76	22.96

[1]See treatment Table 1.

TABLE 3 CHANGE IN CHEMICAL COMPOSITION OF ALFALFA WITH DELAY IN HARVEST (6-YEAR AVERAGE FROM 7 LOCATIONS).

Harvest[1] stages	Cuts	Yields kg/ha	Percent			
			N	P	K	S
Early bloom	1	5600	3.50	0.25	2.50	0.25
Early bloom	2	4480	3.25	0 20	2.45	0.20
Full bloom	1	5682	2.15	0.17	2.08	0.16
Full bloom	2	4502	2.08	0.15	1.85	0.14

[1]Both plots received the same fertilizer treatment (Table 1).

TABLE 4 AVERAGE YIELD OF ALFALFA HARVESTED DURING A 6-YEAR PERIOD (TOTAL OF 2 CUTS)

Treatments kg/ha			Dry Matter[1] Yield
P_2O_5	K_2O	S	kg/ha
0	0	0	6129
23	112	23	7954
45	112	23	8795
67	112	23	10080
89	112	23	11205
67	56	23	7632
67	84	23	9412
67	224	23	12112
67	112	11	8712
67	112	45	10290
67	112	67	9765

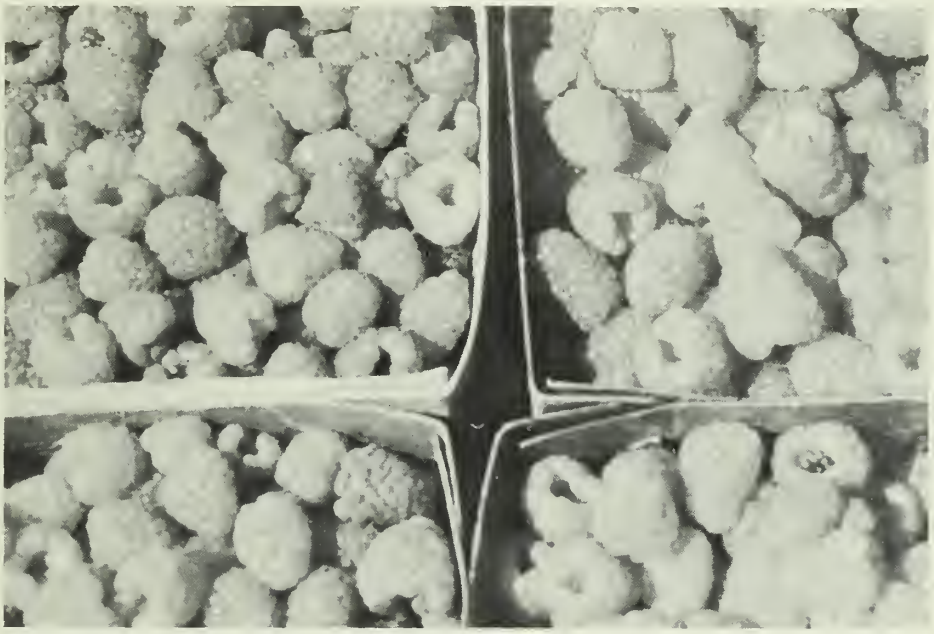
[1]Dry matter calculated at 12% moisture.

The available phosporous and potassium of the soil (0–30 cm depth) ranged from <5 0 to 20 kg/ha P and <80 to 696 kg/ha K respectively. The available sulphate-sulphur ranged from <5 to 21 kg/ha SO_4-S

BREEDING BETTER RED RASPBERRIES FOR B.C.

HUGH A. DAUBENY

Le sud-ouest de la Colombie-Britannique produit plus de framboises par unité de surface que partout ailleurs dans le monde. Pour soutenir cette production record, la Station fédérale de recherches agricoles de Vancouver vient en aide aux producteurs en créant des variétés mieux adaptées à la cueillette mécanique et en effectuant des recherches sur la sensibilité croissante aux maladies de Willamette, principale variété cultivée dans la région.



Fruit of BC 64-9-81 (Carnival x Willamette), right, compared to Willamette, left. BC 64-9-81 is a high yielding, disease resistant selection.

Who produces red raspberries most efficiently in the world today? Southwestern British Columbia! The region harvests an average of 3½ tons/ac of the crop from about 2500 ac (that is, almost 8 tonnes/ha from about 1000 ha).

To maintain this record, B.C. producers of red raspberries must solve two problems.

(1) *Increasing costs.* As harvesting costs continue to increase, particularly for the processing market, growers are turning to mechanical harvesting. If they are to realize the potential advantages of their new equipment, they will need varieties better adapted to machine harvesting and information on suitable cultivation techniques and disease control.

(2) *Increasing incidence of disease.* In recent years, growers have noticed more signs of disease in Willamette, the main variety grown in the region. In particular, they have noted the conditions 'decline' and 'dead bud', which result from interrelated causes. Both conditions seriously reduce yield and hence efficiency.

How are these problems to be solved? As in the past, growers will look to CDA for many of the answers. Much of the required information will come from the department's integrated research program, which includes breeding, cultural, and pathological studies geared to the specific needs of the area.

For example, let us look at several breeding studies, which focus on these two problems.

The Research Station at Vancouver is developing varieties better suited to mechanical harvesting. In the ideal variety, the fruit must shake off readily from the plant. In practice, this means a variety that can be harvested at an advanced stage of maturity.

The researchers, therefore, are seeking varieties with better resistance to fruit rot so that the fruit will suffer minimum deterioration as it matures into advanced stages. These varieties will have a secondary advantage as well: with increased resistance to fruit rot, they will need fewer pre-harvest spray treatments to control the disease.

Dr. H. S. Pepin and I, using a post-harvest screening technique, have now identified two different sources of fruit rot resistance. One source, a selection of the Scottish Horticultural Research Institute, derives its resistance from the black raspberry. A second source is a small-fruited variety, Cuthbert, which is important for the fresh market in British Columbia.

Cuthbert was the source of resistance in the Matsqui variety, which was released in 1969. Although Matsqui fruit is ideally suited to mechanical harvesting, it grows

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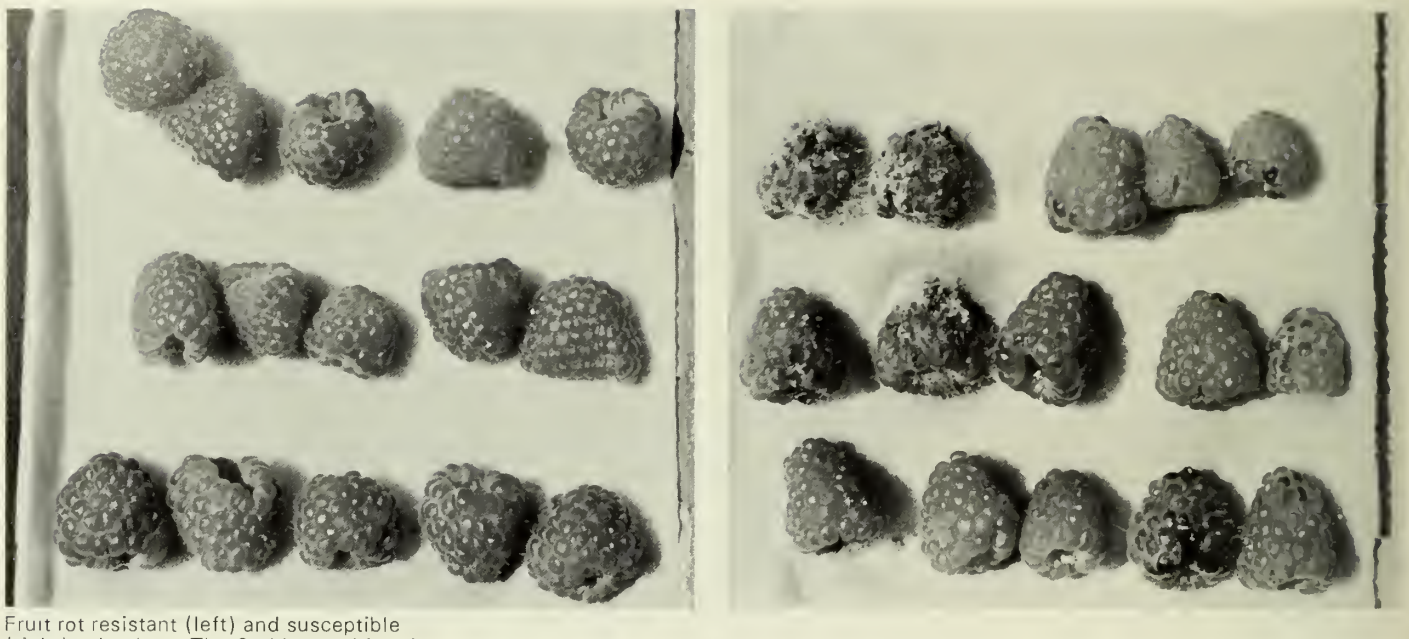


Fruit rot resistant (left) and susceptible (right) selections. The Cuthbert cultivar is the resistant source for 69-6-17.

and yields poorly under most commercial conditions. The research team has not been able to discover why it grows poorly, but they have developed several advanced selections that do grow and yield satisfactorily while having as much rot resistance as Matsqui. One or more of these selections will probably be named within the next few years.

Dead bud seems less prevalent in varieties resistant to spur blight. In 1973, the breeding program released the variety Haida, which is more resistant to the disease than Willamette. Over a period of years in experimental plots, the new variety has consistently outyielded Willamette and also produced more attractive fruit.

The breeding program, since its inception, has sought varieties with immunity to the aphid that transmits mosaic, a serious virus disease. This disease severely limits the production of red raspberries in Eastern Canada but it is controlled through breeding in British Columbia. Haida and most of the advanced selections are immune. If new strains of the aphid should appear, however, as happened in Europe, the present immunity sources might be ineffective. For this reason, the breeding program in cooperation with Dr. R. Stace-Smith, a virologist, constantly searches for new immunity sources to be ready to combat the possibly different strains of future aphids.

Dr. Pepin and Dr. F. D. McElroy, a nematologist, plan to develop new screening techniques so that prior to field planting they can check small seedlings for resistance to nematodes and root rot. Both diseases are associated with decline.

The program now has 1400 selections and seedlings established in the field. From these, the research teams expect to identify several selections that warrant extensive testing in growers' trials and in cooperative trials with other breeding programs.

These breeding projects, as part of the integrated research program, are helping to maintain and to improve efficiency in producing red raspberries. This efficiency will be needed even more in the future.

Because the cost of imported fruit will probably become increasingly prohibitive, the people of British Columbia will rely more and more on locally produced fruits — and no fruit is better adapted to local production than the red raspberry. ■

HAYS CONVERTER — CANADA'S NEW BREED OF CATTLE

Le ministère fédéral de l'Agriculture délivrait récemment le premier certificat d'enregistrement d'une nouvelle race canadienne de bovins de boucherie, la Hays' Converter. Cette race a été créée par le sénateur Harry Hays dans le sud de l'Alberta, à partir de sujets Hereford, Holstein et Suisse brune. Ce dernier commença ses travaux en 1952 avec l'intention de créer une vache de boucherie adaptée aux conditions climatiques canadiennes et alliant une croissance rapide et économique, une ossature grande et robuste et de bonnes aptitudes reproductrices.

The Hays Converter, a new beef cattle breed, is the first livestock breed ever developed by private Canadian interests

Canadian National Livestock Records recently issued the first registration certificate for a new Canadian breed of beef cattle — the Hays Converter. This breed was developed in southern Alberta by Senator Harry Hays from a combination of selected Hereford, Holstein, and Brown Swiss cattle. It is the first livestock breed ever developed by private Canadian interests.

A former mayor of Calgary and federal agriculture minister, Senator Hays began work on the breed in 1952. He wanted to develop a beef cow suited to Canadian conditions, one that combined quick, efficient gains with a large, rugged frame and good reproductive performance.

The building of the foundation of the new breed took place between 1957 and 1963. Since then, the herd has been closed to outside blood, and bulls and cows have been rigorously selected.

It takes many years to establish a new breed. As Dave Young of CDA Livestock Division explains, "The eligibility criteria for a new breed of cattle in Canada require that the first animals to be registered must be from identified parents from a foundation population that has been closed to outside breeding for at least three generations."

Prior to the recognition of the new breed, the foundation herd of 300 females and 25 bulls was inspected in 1974 by representatives from industry, universities, and CDA. The animals inspected were identified as the foundation animals that would be the parents of the first registered Hays Converters.

The foundation cattle are still located at the Hays' ranch near High River, Alberta. They have been described as large, growthy, rugged, and well fleshed. Other characteristics mentioned include strong legs, good hoofs, and excellent udders on the cows.

These cattle are accustomed to wintering under western Canada ranch conditions. Those that have been on federal-provincial R.O.P. tests performed very well.

Although the breed was developed specifically to meet Canadian needs, semen from foundation bulls has already been sold to the U.S., Russia, Cuba, New Zealand, Australia, South America, and Europe.

Now that the Hays Converter is officially recognized as a breed, an association has been incorporated under the Livestock Pedigree Act. Its address is Suite 1508, 6707 Elbow Drive SW, Calgary, Alberta. The president is Senator Hays, the vice-president is D. P. Hays, and the secretary-treasurer is S. B. Williams. ■

PROTECTING BEES IN GREENHOUSES

G. M. WARD

On garde généralement des abeilles dans les serres pour aider à la pollinisation, mais leur survie peut être menacée, par les traitements antiparasitaires. Par conséquent, la Station fédérale de recherches agricoles de Harrow a fait construire une rallonge miniature à la serre, pour loger la ruche et régler ainsi à volonté l'accès des abeilles à la serre.

Greenhouse operators rely on bees to pollinate seeded cucumbers. The grower puts hives of honeybees in the cucumber greenhouse as soon as blossoms begin to appear and leaves them there until harvesting is finished. In Southern Ontario, bees would be in the greenhouse from February until the end of July.

In winter, the grower confines the bees to the house. As soon as the weather is milder, he makes a small opening in the house so that they can escape from the heat of the greenhouse and forage for supplies to augment the material they obtain from cucumber flowers. They always return to the hive before dark.

In excessively hot weather, the temperature in the greenhouse is difficult to control and frequently exceeds the temperature outside. Because long periods of extreme heat often weaken or kill bee colonies, the CDA Research Station at Harrow developed a new way to protect the bees.

Using 13-mm (½") plywood, the scientists designed a box, 67 x 61 x 76 cm (26½" x 24" x 30"), large enough to contain a standard double beehive. The top of the box slopes slightly from front to back to shed rain and has a 2-cm (¾-in.) lip on each side, except on the front where the lip is wider to fit between the greenhouse uprights. They secured two wooden slide rails, 3.8 x 3.8 cm (1½" x 1½"), to the floor of the box so that the hive can be inserted easily. The box rests on an angle-iron bracket, 61 x 49 cm (24" x 19¼"), supported by a brace; a flange fits over the ledge of the greenhouse wall.

The researchers insulated the box with styrofoam, 2.5 cm (1") thick, glued to all inner surfaces, and painted white. They made a narrow opening, 5 x 40 cm (2" x 16"), on the side of the box to allow the bees to get outside. (They recommend that you make this opening on the side facing south or west, if possible.) They painted the border of the opening black to make it easier for the bees to find on their return. In winter, they close the opening with a small door, which swings on a hinge bolt at the top.

A hive of bees can safely remain in this boxlike structure, even while pesticides are being sprayed in the greenhouse.

This box stays outside the greenhouse. To link the box to the greenhouse, a short extension projects from the box and fits snugly into the space normally occupied by one pane of glass in the greenhouse. This particular extension is 13 x 46 x 62 cm (about 5" x 18" x 24") but the dimensions may be adjusted to suit any greenhouse.

The box has two removable, airtight doors. The back door opens on the side of the box opposite the greenhouse; it is used to install or remove the hive. The front door opens into the extension leading to the greenhouse. When a hive is in action, the front door is removed to allow the bees access to the flowers inside the house; when pesticide sprays or smokes are being applied to the crop, this door is closed to confine the bees to the protection of the box. With this box, you do not have to move a hive during spraying as you would a hive kept inside a greenhouse.

The researchers at Harrow have used this box effectively for several seasons. A local beekeeper there highly recommends it to Essex county cucumber growers who rent his bees. Hives protected this way remain strong and active throughout the season. ■

Dr. Ward is the senior research scientist in greenhouse crops nutrition at CDA Research Station, Harrow, Ont.

SEED EARLY FOR BETTER GRAIN YIELDS

H. G. NASS, H. W. JOHNSTON, J. D. E. STERLING, and J. A. MacLEOD

Les agriculteurs des provinces Maritimes doivent maintenant importer la moitié des céréales secondaires nécessaires à l'alimentation du bétail. Pour accroître les rendements de ces céréales, les spécialistes de la Station fédérale de recherches agricoles de Charlottetown cherchent à élaborer de meilleurs méthodes de production. En s'inspirant des recherches décrites dans le présent article, ils recommandent les semis précoces au printemps comme l'un des moyens pour accroître les rendements de blé, de l'avoine et de l'orge de printemps.

Two varieties of barley, Olli and Keystone, seeded at different dates in 1975. Guard plots of barley can be seen on left

Maritime farmers need all the grain they can grow. They use most of it as livestock feed and still import as much again to meet their needs . . . but the price of grain keeps rising.

For this reason, scientists at the CDA Research Station at Charlottetown, P.E.I. are looking for ways to improve yields of small grains through better production practices.

They know that Maritime farmers often delay until early June to seed small grains because of wet weather or because they are busy with other operations on a mixed farm. The researchers, therefore, decided to find out what effects earlier planting had on yields and other factors.

They planted spring wheat, oats, and barley in experimental plots in 1972 and 1973. The crops were seeded on the earliest possible dates (May 27, 1972 and May 2, 1973) and on later dates to evaluate the effect of seeding date.

The results of these plantings are shown in Table 1. Early seeding produced better yields. When seeding was delayed beyond the first possible seeding date, yields were greatly reduced. In 1972, yields were much less from crops planted only 5 or 12 days later than the initial seeding. (In 1972, the first possible seeding day was late; it is around the middle of May on the average.)

Other factors, such as climate, soil conditions, and diseases also affect yield each year. For example, 1972 was a good year for barley: all the 1972 barley yields, regardless of seeding date, exceeded those of 1973. Nonetheless, crops seeded early each year did better than crops seeded later in the same year.

Crops seeded early were shorter and less subject to lodging. As seeding was delayed, bushel weight and kernel weight decreased; the seed obtained was smaller and lighter.

Late seeding delayed crop maturity. In 1972, the seeding on June 18 matured about one month later than the first two seedings. Because the growing season for spring small grains is restricted in the Maritimes, crops seeded later are handicapped by a less favorable growing season and poorer weather for harvesting than crops seeded earlier. With late seedings, the crop is subject to attacks by disease at a more critical stage of plant development.

The authors are cereal crop specialists at the CDA Research Station, Charlottetown, P.E.I.

To judge the vulnerability of crops seeded later, examine the evidence gathered on leaf disease in oats and barley in 1973 (Table 2). Crops planted on the first two seeding dates did not suffer as severe attacks of the disease as those planted on the last three seeding dates.

Foliar spraying (4-6 applications with a Maneb formulation) helped to control the disease but did not compensate for delayed seeding. The two early crops did not benefit much from the spraying — because they had little need of it. In the three crops seeded later, the spraying reduced but did not completely control the disease; yields from these crops were improved by spraying but did not equal yields from crops seeded on the earliest date.

Evidently, earlier seeding can be more profitable than spraying. Too much spraying injures crop seedlings and more than one application is not economical. Even if spraying were more economical, it would still be better to plant early when possible so that most plants would escape the disease and yields would be maximized.

The results of this research show that small grains must be seeded as early as possible in spring to obtain the highest yields. Only two years data are shown here, but similar results have been obtained in other years at various locations in the Maritimes.

If a small grains producer has a large acreage to seed, he may find it difficult to get all the seed in early. Other research studies in the region suggest that he may be able to start seeding as early as the last half of April some years if he uses special seeding equipment and a slightly higher seeding rate. ■

TABLE 1 EFFECT OF SEEDING DATE ON YIELD AND OTHER AGRONOMIC FACTORS OF SMALL GRAINS.

Grain	Date seeded	Date ripe	Yield	Yield reduction by late seeding	Diseased area on upper two leaves
			bu/ac[1]	bu/ac[1]	%
1972					
Oats	May 27	Aug 29	135	—	72
	Jun 1	Sep 1	107	28	68
	Jun 8	Sep 4	85	50	100
Barley	May 27	Aug 21	110	—	58
	Jun 1	Aug 28	95	15	86
	Jun 8	Sep 2	78	32	100
Wheat	May 27	Sep 3	71	—	36
	Jun 1	Sep 7	62	9	26
	Jun 8	Sep 10	50	21	93
1973					
Barley	May 2	Aug 11	66	—	14
	May 17	Aug 13	58	8	26
	May 28	Aug 24	51	15	82
	Jun 6	Aug 28	40	26	89
	Jun 18	Sep 12	35	31	90
Oats	May 2	Aug 6	111	—	12
	May 17	Aug 16	82	29	13
	May 28	Aug 24	79	32	31
	Jun 6	Aug 28	72	39	67
	Jun 18	Sep 8	58	53	83

[1]1 bu/ac of oats equals about 38 kg/ha; 1 bu/ac of barley equals about 54 kg/ha; 1 bu/ac of wheat equals about 67 kg/ha.

TABLE 2 EFFECT OF FOLIAR SPRAYS ON YIELD OF SMALL GRAINS IN 1973.

		Seeding date				
		May 2	May 17	May 28	June 6	June 18
Oats						
	No spray	131	99	92	83	59
	Sprays	131	94	99	94	85
Barley						
	No spray	69	63	51	39	37
	Sprays	71	66	62	54	43

[1]1 bu/ac of oats equals about 38 kg/ha; 1 bu/ac of barley equals about 54 kg/ha

SEEDING BARLEY IN THE NORTH

D. G. FARIS

Les chercheurs de la Station de recherche de Beaverlodge ont constaté qu'en règle générale, une faible densité de semis ne convient pas à l'orge dans le nord l'Alberta. Bien qu'une densité de 3 millions de grains/ha (2 boisseau/acre) coûte plus cher que les taux plus faibles et donne des semences plus petites, elle donne un rendement plus élevé, une paille plus courte et, fait très important, une maturité plus précoce.

What seeding rate will help achieve optimum yields of barley in northern Canada? CDA northern research stations conducted a 2-year study to find the answer.

They knew that low seeding rates greatly increase cereal yields in the southern Prairies. But would this be true under the different growing conditions of the north? Were yield criteria even the same?

To find out, they grew three varieties of barley (Olli, Parkland, and Conquest) at Beaverlodge, Alberta (55° 12′), Fort Vermilion, Alberta (58° 18′), and Fort Simpson, N.W.T. (61° 52′). In each variety, seeds were sown with 15-cm (6-in.) row spacings at these rates:

millions of seeds/ha	equivalent bu/ac
0.75	0.5
1.5	1.0
3.0	2.0
6.0	4.0

After two years of collecting data, they assessed the results. The researchers judged each seeding rate on total yield achieved and also on other criteria important to northern growers: earliness, straw length (for resistance to lodging), seed size, and seed cost (i.e., higher seeding rates mean higher costs).

Surprisingly, the seeding rate showed little effect on total yield. Although the seeding rates varied by a factor of eight, there was only a seven percent spread in the yields obtained. Evidently barley plants can adapt to a wide range of seeding rates (Figure 1). The 3 million seeds/ha rate produced the best yields on the average. (This rate is close to the rate of 2.25–3.0 million seeds/ha, which was recommended up to that time for northern Canada.)

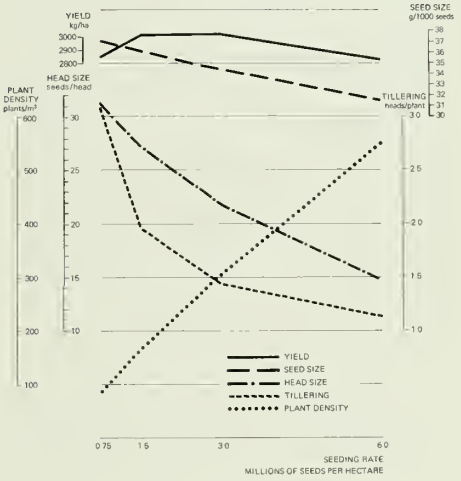
The researchers also evaluated the composition of the yield. In barley, yield depends on (i) plant density, which increased as seeding rate increased; and also, in order of development, on (ii) tillering (number of heads per plant), head size, and seed size, which all decreased as seeding rate increased. The later a part of the plant develops, the less it is affected by the seeding rate.

The study showed that seeding rate does affect earliness of crop maturity. Crops sown at the highest seeding rate matured 3.4 days earlier on the average than those sown at the lowest rate (Table 1); crops sown at 3 million seeds/ha matured 1.6 days earlier than those sown at 1.5 million seeds/ha. In northern Canada, a lead of even one or two days can be critical in avoiding frost.

Higher seeding rates tended to reduce plant height (straw length, see Table 1), which helps avoid lodging in the crop. Yet seeding rate had little consistent effect on seed test weight (bu wt).

The researchers concluded that low seeding rates are not generally suitable for barley grown in the north. Seeding rates above 3 million seeds/ha are also not recommended: although the crop matures a few days earlier and has shorter straw, these advantages are outweighed by reduced yields and seed size and increased cost of seed.

Based on all the evidence, the research team recommends a seeding rate of 3 million seeds/ha to best meet the needs of northern production. Compared with lower seeding rates, seed costs will be higher and the seed produced will be a bit smaller. Yields, however, will be slightly higher on the average, straw will be shorter, and crops will mature somewhat earlier. ■



Barley yield and yield components at four seeding rates.

TABLE 1 EFFECT OF SEEDING RATE ON BARLEY CHARACTERISTICS.

Characteristic	Seeding rate (millions of seeds/ha) 0.75	1.5	3.0	6.0
Days to mature	85.2	84.1	82.5	81.8
Plant height (cm)	79.9	79.7	75.2	68.1
Seed test weight (kg/hl)	62.7	62.5	62.6	62.8

Dr. Faris is Head, Cereal and Oilseed Section, CDA Research Station, Beaverlodge, Alta.

HOW WELL DO HYBRID COWS CONVERT FEED INTO BEEF?

D. M. BOWDEN

La grande diversité des races bovines dont on dispose aujourd'hui, oblige les éleveurs de bovins de boucherie à savoir quel type de vaches aura le meilleur indice de consommation et leur donnera un revenu maximum sous forme de veaux sevrés et de carcasses de boeuf. A cet effet, la Station fédérale de recherches agricoles de Lethbridge étudie jusqu'à quel point les vaches de boucherie assimilent les aliments durant la croissance, la gestation et la lactation, et comment la taille influe sur l'indice de consommation. Les chercheurs ont utilisé des taures croisées F_1 pour obtenir une gamme complète de tailles: Simmental x Angus, Charolais x Angus, Hereford x Angus et Jersey x Angus.

Barn with individual feeding pens that aid in assessing efficiency of feed use by beef cattle.

Beef cows eat a lot – and larger cows eat more. With so many types of cattle available, beef producers need to know which type of cow will make best use of feed to bring a maximum return in weaned calves and beef carcass.

At the CDA Research Station at Lethbridge, we are finding out. In 1970, we started a study to measure how well female beef cattle use nutrients during growth, pregnancy, and lactation, and how this efficiency is influenced by body size.

We obtained crossbred heifers for the experiment because they offer a range of sizes. The animals were brought in three groups in 1970, 1971, and 1972 from the USDA Meat Animal Research Center of Clay Center, Nebraska. Simmental x Angus cows were chosen for large size and high level of milk production; Charolais x Angus for large size but lower level of milk production; Hereford x Angus for intermediate size; and Jersey x Angus for small size.

All animals started on feed at Lethbridge about 2 months after weaning at an average age of 270 days. Each is fed in an individual pen and her daily intake is recorded. Half the herd were fed to attain body weights normal for their type; the other half received about 15 percent more feed. The calves are fed free choice in individual pens.

The diets are high in grains rather than roughage. In this way, the daily ration can be weighed more accurately. Also, less feed will be wasted than can happen, for example, when animals pull hay out the manger.

The nutrient content of the diet is carefully checked. Sheep are used in digestion trials to determine the amount of digestible energy and protein in the ration. Feed samples are analyzed each month to determine the percentage of dry matter, crude protein, calcium, and phosphorus in the diet.

The heifers were first bred as yearlings by artificial insemination. In the first calving, they achieved a reproductive performance comparable to others of their type under extensive management in performance studies at Lethbridge, Brandon, and Clay Center.

For the first two calvings, semen from one Red Poll bull was chosen to reduce the possibility of the cows having difficulty calving. In the next two calvings, researchers plan to

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use a Brown Swiss bull to find out if the type of bull influences efficiency in feed conversion.

The researchers found that different crossbred types consumed different amounts of digestible energy during the growing period until first calving (i.e., from average age 270 days to 755 days). Jersey x Angus heifers needed 6 percent more digestible energy per pound of metabolic weight than the other three types. The researchers also noted a similar 6 percent difference between years.

Heifers receiving the extra 15 percent feed ration achieved greater fleshing rather than greater skeletal growth. These heifers were 6 percent heavier at first calving than others of their type that did not receive the extra ration, but calf weight was not affected.

Milk production was measured in the first lactation at 6, 14, and 22 weeks after calving. The amount of total milk, milk fat, milk protein, and milk energy produced varied between the four types of crossbred heifers. Jersey x Angus heifers produced the most energy from milk, followed by Simmental x Angus, and Charolais x Angus. Jersey x Angus heifers produced 20 percent more energy from milk than the Charolais x Angus heifers.

The researchers found that milk production was also influenced by the level of feeding. Heifers receiving the 15 percent extra energy in their feed produced 9 percent more energy in their milk.

The amount of milk produced by each heifer affected the amount of creep feed consumed by her calf from birth until weaned in 200 days. Calves receiving less energy from milk needed more creep feed. All calves, regardless of dam type, averaged similar daily gains from birth to weaning. Jersey x Angus heifers and their first calves consumed about 9 percent less total digestible energy per pound of calf weaned than the other crossbred types.

This study at Lethbridge is continuing. Our work suggests that the size of the cow and her milk production do influence the efficiency of feed use, at least in some periods. We are collecting more complete information throughout the cow-calf production cycle, including data on how much feed the calf consumes during the finishing period until slaughter and the weight of the carcass and lean meat produced.

With this added information, scientists will be able to define more accurately the influence of cow size and milk production on efficiency in feed use. They will also use the data from this study in computer simulation models of beef cow-calf and feedlot finishing systems to assess the influence of type of cow and some nutritional factors on the economics of these enterprises. ■

Charolais x Angus cow with Red Poll sired calf at weaning. Large cows produce large calves at weaning

FORAGE PRODUCTION ON B.C. ORGANIC WETLAND SOILS

A. L. van RYSWYK

Les terres basses organiques de l'intérieur de la Colombie-Britannique peuvent produire autant de fourrages pour les bovins de boucherie que les luzernières irriguées de la région de Kamloops. Pour obtenir une production fourragère sur ces sols, il faut suivre des méthodes d'exploitation spéciales notamment le contrôle de l'eau, l'établissement d'espèces cultivées tolérantes à l'eau, la fertilisation et des techniques de récolte appropriées.

Origin of wetland soils About 10 percent of the land area between Clinton and Quesnel, and between the Cariboo and Coast Mountains in British Columbia (latitude 52° to 54°, longitude 124° to 128°), is occupied by wetlands, most of which are covered by Organic soils. These soils have, by definition, a surface deposit of accumulated organic material greater than 40 cm (16 in.) thick. They were formed in shallow lake basins that were shaped by the Cordilleran ice sheet as it advanced, or in old beaver ponds constructed along drainageways. Development first occurred by the accumulation of areal vegetation until depths of up to 9 m (30 ft) of organic material were reached. The areal vegetation consisted mainly of water tolerant sedges, grasses, and shrubs, which still occupy these sites.

Present use Most of the areas covered by the wetlands have been alienated. New grazing and hay lands are not readily available to the rancher. Thus, ranchers are seeking ways to increase forage production on all lands, particularly the unimproved wetlands. These lands produce an average of 1120 kg/ha (0.5 ton/ac) but this fluctuates widely depending on flood or drought conditions.

The wetlands occur in climates that favor forages but are too severe for many other crops. They are all subirrigated, nearly level, and stone- and sand-free, but they lack drainage, are usually infertile, and have poor trafficability and low productivity in the native state. Thus, to obtain maximum forage production in Organic soil wetlands, specific steps must be taken. These include water control, establishment of tame, water-tolerant species, fertilization, and proper harvesting.

Water control Control of the water level on meadows is a major key to consistent forage yields. Complete drainage by deep ditching is not recommended because it promotes rapid decomposition of the upper Organic layers resulting in rapid loss of soil. This greatly reduces the effectiveness of subirrigation. The water table is kept at less than 1 m (3 ft) from the surface during the growing season. If the vegetation cover is mainly native coarse sedges, shallow flooding during late spring and early summer promotes the best growth. The water must be drained off the meadow early enough so that haying of these sedges can be carried out in August. The fine native sedges and grasses and the tame species do not thrive under flooded conditions but do best when the water table is kept below the land surface. This type of water control is accomplished by shallow surface ditches (including one around the perimeter of each particular wetland area to intercept and divert drainage from surrounding upland areas) and by small temporary dams in these ditches. Excessive drainage early in the season can result in summer drought. Much of the water will be removed by transpiration from the growing crop in time for late June harvest of tame species.

Species selection Tame species have a much higher potential for forage production than do most of the native ones, particularly under optimum soil fertility levels. Timothy, meadow foxtail, and certain clovers have been established on Organic soils but reed canarygrass appears to be the most satisfactory. Once established, it competes vigorously

Reed canarygrass on new breaking on a medium decomposed organic soil, seeded May 24 and harvested August 24, showing extreme nutrient deficiencies. The plot with tall, dark vegetation in the foreground with N, P, K, and S fertilizer yielded 6 750 kg/ha (3.0 tons/ac) dry matter. The plot immediately to its left, with N, P, and K fertilizer, yielded 1 540 kg/ha (0 69 tons/ac) while those plots receiving no fertilizer yielded 80 kg/ha (0 04 ton/ac)

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and responds best if well fertilized. Sheet-ice formation in midwinter has caused killing of all species on research plots but reed canarygrass has recovered due to its vigorous rhizomes. Reed canary withstands prolonged periods of flooding but it lacks tolerance to alkaline and/or saline soil conditions — a rarity on the Organic soils. Research has shown that clovers, such as Alsike included with a grass, rarely persist as a significant portion of the stand.

Land preparation Tame species are successfully established only when native species are destroyed. This can be done by deep plowing. A large brush-breaker plow, equipped with a special long sloping knife-coulter, has proven highly successful for completely turning over sedge and shrub sod. The intact buried sod layer supports machinery and when the plowing is done in the direction of land slope, the furrow bottom will provide some under-drainage. Shallow discing is all that is required to prepare an adequate seed bed. Rototilling has also been used but native species are only partially destroyed, trafficability is poorer, and no under-drainage is provided. Some levelling may be desirable. Seed and fertilizer are best applied by broadcasting followed by light harrowing. The final and important step is thorough packing so that moisture is drawn to the soil surface to keep the seed zone moist. Seeding may be done in the spring when the soil is sufficiently dry, or in late fall so that germination does not occur until the following spring. Seeds of all species, especially reed canarygrass, have to be tested for germination just prior to seeding so that seeding rates may be adjusted accordingly.

Fertilization There is no advantage in establishing tame species on wet meadows unless soil fertility is kept optimum. Soil analyses, comfirmed by growth room and field trials at Kamloops, have shown that Organic soils of Interior British Columbia are generally well supplied with calcium so that liming is rarely required. They do, however, require nitrogen, phosphorus, potassium, and sometimes sulfur for maximum forage production. Based on field plot experiments, a general recommendation for initial fertilization of both native and tame species would be 100 kg/ha of nitrogen (N) (90 lb/ac N), 25 kg/ha phosphorus (as P) (22 lb/ac P), 90 kg/ha potassium (as K) (80 lb/ac,), and 25 kg/ha sulfur (S) (22 lb/ac). When tame species are harvested twice in the season, an additional application of 85 kg/ha N (75 lb/ac N) is made after the first harvest. Nitrogen must be applied every fall or early spring, and also after the first cut if two cuts are taken because nitrogen not used by plants dissipates during the growing season on the Organic soils. Phosphorous, potassium, and sulfur refertilization requirements in subsequent years have to be estimated by soil-test analyses. Current soils research at Kamloops is designed to correlate soil-test values to field yield-responses of reed canarygrass fertilized at different rates.

Harvesting Most forages grown on wetland sites deteriorate much more rapidly in quality after reaching their maximum vegetative growth than do those grown on well-drained sites. Thus, harvesting is started near or before the late-boot stage of growth of sedge or grass species either by cutting for silage or hay, or by grazing. Harvesting systems for tame wetland species may consist of grazing in the early season followed by cutting in the fall or the reverse. Native species usually are not capable of providing two harvests in a season, other than a small amount of grazable regrowth. Regrowth is desirable for winter survival. However, regrowth can be harvested after fall frosts have caused dormancy in the plants.

Nutritional value of meadow hays In winter feeding trials conducted at the Research Station, at Kamloops, fertilized and unfertilized sedge hay produced nearly the same gains, 0.23 kg/day (0.49 lb/day), but less than gains produced by alfalfa hay, 0.37 kg/day (0.78 lb/day), when the three hays were fed at the same rate to steer calves. The lower gain from the sedge hays may be attributed to their lower protein and phosphorus content. In general, sedge hays are deficient in copper, zinc, and selenium. Calculated beef yield for the fertilized sedge hay was 214 kg/ha/yr (474 lb/ac/yr), which was about 2½ times that of the unfertilized sedge hay. The principal effect of fertilization was to increase dry matter production per hectare rather than improve digestibility of the forage.

Potential for beef production Nylon-bag dry matter digestibility studies at Kamloops have shown that the nutritional value of reed canarygrass growing on reseeded wet meadows is superior to that of native sedge and comparable to that of alfalfa. Considering that dry matter yields of up to 11 200 kg/ha/yr (5 tons/ac/yr) of reed canarygrass can be obtained on wetlands, the potential for producing beef from these lands could approach that of irrigated alfalfa lands in the Kamloops area. ■

FOOD STORAGE — A NEW IMPORTANCE

F. R. FORSYTH

Une des quelques rares possibilités d'accroître la production alimentaire est de conserver une plus grande proportion des aliments déjà produits. Des recherches sur l'entreposage ont démontré qu'on peut obtenir une plus longue conservabilité des fruits et des légumes de haute qualité. Nous pourrions dépendre moins des importations d'aliments en cultivant à la fois les variétés tardives et hâtives qui s'entreposent bien.

The human population of the world is already too large to be adequately fed by the present level of food production. Georg Borgstrom, Univ. of Michigan Professor, says, "if the present food resources of the world were to be distributed equally, we would all starve." Many people now say that we must increase the yearly production of food threefold. That is a worthwhile goal, but other important factors have been overlooked or have not received proper emphasis.

Ten to 20 percent of the world's food crops are destroyed by pests before harvest and 2 to 100 percent are destroyed after harvest because of inadequate storage facilities. Apparently, in addition to increasing yield, an equal effort should also be directed towards protecting the crop before and after harvest. The "yield" could be doubled simply by crop protection before and after harvest. Good storage facilities would be the key to post-harvest crop protection.

Another factor in promoting effective storage of locally produced food is the high cost of transporting food, both locally and world-wide. Canadians spend between 26¢ and 30¢ of their grocery dollar on imported food. During the winter 70¢ of every dollar spent on fruits and vegetables goes for imported produce.

The storage of locally produced fruits and vegetables under optimum conditions for the maximum length of time is important. By growing early maturing varieties we can lessen our dependence on imports early in the season, and with late maturing varieties that store well we can extend the import-free period at the close of the growing season.

What Canadian food production lends itself to early production and an extended storage period? Carrots are in this category because of the large volume imported each year from the U.S.A. during the winter and spring months. Early maturing varieties should be grown to supply the local need early in the summer, and then later-maturing varieties that store well could provide carrots for most if not all of the remainder of the year. However, more high quality storage depots would be needed. Cabbages also could be treated like carrots. They can be stored successfully for at least an 8-month period.

We should be able to provide quality apples for 12 months of the year. More attention would need to be given to increased production of early maturing, high quality apples and also to late maturing apples capable of being stored for 12 months or even 2 years. There is an advantage in holding part of the year's crop into the following marketing season because there are rarely two bumper crops in consecutive years. New varieties capable of long-term storage may need to be developed by plant breeders.

Pears are perhaps the poorest handled and imperfectly exploited fruit in Canada. For desserts, they require special care. But with emphasis on storage temperature and conditions of temperature and humidity during ripening, Canadian-grown pears could provide year-round, fresh fruit.

Storage research has shown that longer storage life of high quality fruits and vegetables can be developed. First, it was the application of controlled atmosphere storage to fruit, and more recently, vegetable storage that allowed a longer marketing season for 1-year's crop. Lately, the improved control of storage diseases with benzimidazole compounds and the development of low pressure storage (not yet commercially feasible for most products) are making even longer term storage a possibility.

Perhaps, most important is the development of the "cold chain concept" where once a product is ready for harvest (for example apples), it is removed from the plant and its temperature is lowered to the long term storage temperature. While the product is being packaged, displayed or even held for sometime in the consumer's refrigerator, it is not allowed to vary from the optimum temperature for preservation until it is finally prepared for consumption.

Obviously, one of the few remaining alternatives to growing more food is the preservation of a greater percentage of food already being produced. For this reason, food storage attains a new importance. ■

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DETERMINING SEX OF CALF EMBRYOS

DAVID SMITHERS

Les spécialistes de l'Institut de recherches vétérinaires du ministère fédéral de l'Agriculture ont élaboré une méthode pour déterminer le sexe des embryons de veaux retirés de l'utérus de la mère. La nouvelle technique accoîtra l'efficacité des transplantations d'embryons puisqu'il sera désormais possible de choisir des veaux mâles ou femelles pour répondre aux différents besoins des sélectionneurs de bovins laitiers et de boucherie.

Scientists at the CDA Animal Diseases Research Institute have developed a method for determining the sex of calf embryos removed from the mother's uterus.

The new technique will increase efficiency in embryo transfers because either bull or heifer calves can be chosen to meet the differing needs of dairy and beef cattle breeders.

In normal transfer operations, the fertilized eggs are removed from the donor cow five to six days after conception. The research team, however, has found it possible to delay removing the unsexed embryos until 16 days after onset of the donor's heat cycle.

This delay allows the embryos to develop from a small spherical shape to a larger, more elongated form varying in length from 1 to 35 mm. As soon as the embryos are removed, microsurgery is performed to take a biopsy. The cells contained in this tissue slice are analyzed to identify the sex chromosome.

David Smithers is a science writer with CDA News Media Services in Ottawa.

A heifer born Christmas Day as a result of an embryo transfer. The new technique allowed researchers to know its sex nine months before it was born.

A photomicrograph of a calf embryo 14 days after conception. The actual length of this embryo is 4 5 millimetres. The end from which the slice of tissue was surgically removed can be clearly seen. The tissue is used for chromosomal analysis to determine sex.

While the analysis is taking place, the embryo is incubated in a tissue culture medium for about three hours. Then, if it is of the desired sex, it can be transferred to a recipient cow.

The technique also permits scientists to produce same-sex twins using embryo transfer techniques. Because the sex of the embryos can be identified, breeders can avoid the undesirable male-female twin combination, in which the female is usually sterile.

The CDA veterinary research team — Keith Betteridge, Bob Eaglesome, Douglas Hare, Douglas Mitchell, and Geoff Randall — will describe their new procedure at the International Congress on Animal Reproduction and Artificial Insemination in Poland in July, 1976. ■

LE MOUVEMENT DE L'EAU DANS LES SOLS ARGILEUX

C. R. De KIMPE et
G. R. MEHUYS

Vertical water movement through the soil is determined by pore size distribution and continuity. Measurements of saturated hydraulic conductivity integrate these factors and are essential to the design of an effective drainage system.

A la Station de Recherches de Sainte-Foy, un programme de recherches visant à comprendre le mouvement de l'eau dans les sols agricoles des basses-terres du Saint-Laurent a été entrepris. Il est nécessaire d'en préciser les mécanismes si on veut répondre aux besoins d'une agriculture sans cesse plus intensive.

Les sols et l'eau sont deux ressources naturelles qui conditionnent les possibilités d'utilisation des sols de façon permanente. Ces ressources peuvent être considérées comme stables à l'échelle de l'homme, dans la mesure où celui-ci n'intervient pas pour les manipuler selon ses besoins. Cette intervention n'a qu'une faible incidence sur les facteurs externes comme le climat et le relief, mais elle est de plus grande importante pour l'interaction sol-eau. Les pratiques culturales, le drainage et l'irrigation se reflètent sur la qualité des sols et de l'eau. Une mauvaise gestion peut provoquer une dégradation permanente du sol ainsi que des problèmes de pollution des eaux de ruissellement et du sous-sol.

Dans un contexte climatique défini, un sol donné va atteindre lentement un niveau de développement un équilibre avec les autres facteurs de formation des sols. Les processus de développement affectent le solum et pour ce qui nous préoccupe ici, mentionnons, par example, les alternances de gel et de dégel, les cycles d'humidification et de dessication, le lessivage de particules fines, l'incorporation de matière organique et sa décomposition subséquente par les microorganismes. Ces processus ont contribué à diminuer la densité apparente et au lieu du matériau compact que l'on retrouve au niveau de la roche-mère, nous observons un sol dont le volume poreux peut atteindre 30 à 60% du volume total dans les sols minéraux.

Des prélèvements d'échantillons de sol non dérangé et un examen morphologique détaillé des sites nous permettent de déterminer en laboratoire les valeurs de densité apparente et quelques propriétés du volume poreux. Plus importants que

La nappe phréatique dans les sols agricoles des basses terres n'est jamais loin de la surface, même en été.

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la totalité du volume poreux, le mode de distribution et la continuité des pores assurent la transmissibilité de l'eau. Un sol à texture grossière tend à être moins poreux qu'un sol à texture fine, et l'eau y circule plus facilement à cause du plus grand diamètre moyen des pores. Certains sols argileux ont la propriété de gonfler par saturation d'eau et donc la porosité totale est variable. De plus, on y observe fréquemment un entraînement des plus fines particules qui s'accumulent dans les horizons inférieurs du solum. Ces revêtements argileux («argillanes») peuvent même bloquer entièrement certaines pores et ainsi créer une porosité vésiculaire qui ne contribue plus à la transmission de l'eau.

La facilité avec laquelle un sol peut transmettre l'eau d'un endroit à un autre s'exprime par la conductivité hydraulique, communément appelée, à tort d'ailleurs, la perméabilité. Celle-ci est maximum lorsque le sol est saturé d'eau, mais diminue très rapidement dès que le sol sèche. La plupart des sols agricoles du Québec sont encore très peu connus au point de vue régime hydrique. Les études de drainage concernent surtout l'écoulement de l'eau en milieu saturé et la conductivité hydraulique saturée est le paramètre le plus important intervenant dans le calcul de l'espacement des drains. Cependant, ce n'est que depuis trois ans que les bureaux d'études de la province font intervenir la conductivité hydraulique dans les projets de drainage.

Il existe de nombreuses méthodes pour mesurer ce paramètre, tant au champ qu'en laboratoire, mais aucune n'est parfaite et ne donne des résultats absolument exacts, à cause de l'hétérogénéité des sols et des conditions expérimentales difficiles à contrôler. Les valeurs peuvent aussi varier au cours des saisons par suite de modifications dans la structure du sol. Ceci sera surtout observé dans l'horizon de labour. Par contre, dans les horizons profonds, où la structure est plus stable, la conductivité hydraulique saturée est relativement constante.

Les résultats obtenus jusqu'à présent indiquent que dans les argiles lourdes des basses terres, la conductivité est plus élevée que prévue, de l'ordre de 2 à 75 cm/h. Les valeurs habituelles pour des sols à texture comparable seraient 100 fois plus faibles. Il est aussi intéressant de noter que dans les horizons profonds dont la teneur en argile est très élevée (70%), la conductivité hydraulique saturée est du même ordre de grandeur que dans les horizons de surface (40% d'argile). Il existe, en profondeur, une zone de saturation en eau quasi permanente, caractéristée par la couleur gris-bleu de l'argile réduite et par l'absence de structure visible à l'œil nu. Nous y avons cependant observé, lors des échantillonnages, des fissures conchoïdales qui pourraient assurer un chemin préférentiel à l'eau et expliqueraient ainsi les valeurs élevées de conductivité.

Le prélèvement d'un échantillon non dérangé se fait par découpage au couteau.

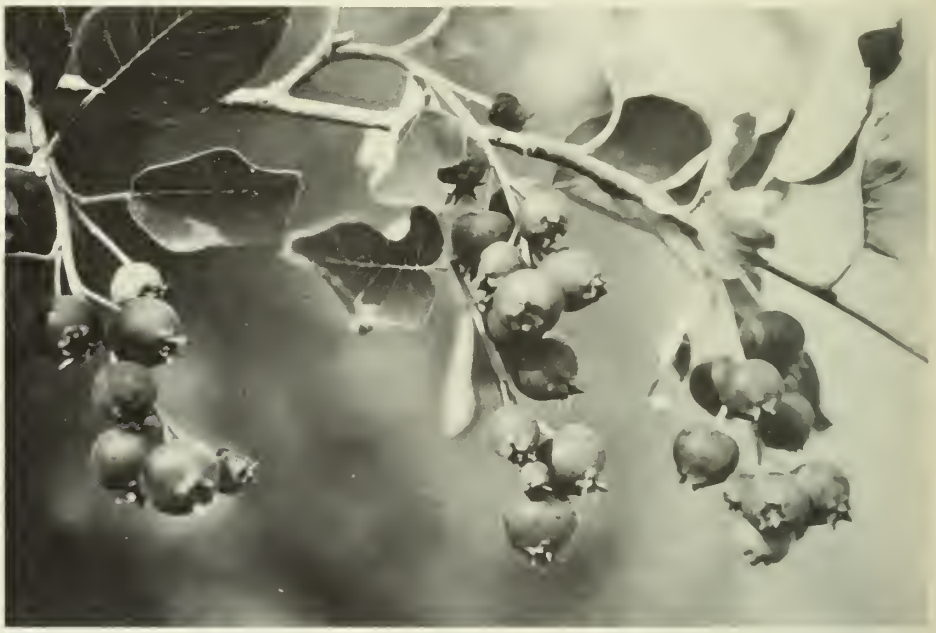
Nous ne voulons cependant pas donner l'impression que les sols agricoles du Québec ne présentent aucun problème pour l'élimination des excès d'eau. Le cas se pose surtout au printemps lors de la fonte des neiges mais aussi lors de périodes de pluies abondantes.

Au printemps, si le sol est gelé à la fonte des neiges, le pouvoir de transmission n'est pas en cause. Il est alors essentiel d'avoir un drainage de surface bien aménagé et bien entretenu. Par contre, si le sol n'est pas gelé, l'eau de fonte relève la nappe phréatique, provoque l'engorgement du sol et dans de ce cas, le drainage souterrain peut accélérer l'élimination des excès d'eau. ■

THE SASKATOON — CANADA'S NATIONAL FRUIT?

R. E. HARRIS

L'amélanche est un petit fruit fort apprécié depuis longtemps, aussi bien à l'état sauvage qu'en culture, et dont la production commerciale suscite depuis quelques années beaucoup d'intérêt dans les secteurs de la commercialisation et de la transformation, ainsi que chez les producteurs éventuels. L'article fait état de la création de cultivars d'amélanches et des divers aspects de la production.



Branches bearing saskatoons.

Saskatoons *(Amelanchier alnifolia)* have long been a favorite wild and home garden fruit. Now they are being developed into a commercial crop that is uniquely Canadian. Both the marketing and processing industry and potential growers are showing interest.

The *Amelanchier* are native to all parts of Canada but the first cultivar, 'Success', was introduced by H. E. van Deman of Kansas in 1878. It was probably a dwarf strain of *A. canadensis*. No further cultivars were were introduced until the CDA Research Station at Beaverlodge released 'Smoky' and 'Pembina' in 1952, after many years of testing and selection.

Since then, three more cultivars have been named: 'Altaglow', an attractive ornamental, was introduced by the Alberta Horticultural Research Station; 'Northline' by the Beaverlodge Nursery; and 'Forestburg' by the CDA Research Station at Beaverlodge. About 150 selections from a breeding program started in 1959 are being tested at the CDA Research Station, Beaverlodge; no overall improvement has been identified but single characters, such as flavor, have been enhanced.

Saskatoons have many characteristics desired in a commercial crop. They are hardy, tolerant of a wide range of soils, and productive for 25 years or more. Moreover, they can be harvested mechanically in a once-over operation, and they ship well.

Recently, the Peace Country Small Fruit Cooperative was formed to promote production of small fruits, particularly the saskatoon. Growers now have 15 ac (6 ha) in saskatoons and could increase production to 400 ac (160 ha) if more plants were available.

But obtaining sufficient plants is the biggest difficulty in establishing saskatoons as a commercial crop. They can be grown from soft wood cuttings under mist but the cuttings often do not produce enough roots to survive the winter while the plant is dormant.

Ideally, saskatoons could be propagated from root sprouts. Bushes from root sprouts planted directly in the field come into production much earlier than bushes from seedlings or from root sprouts transplanted from the nursery. Each bush has only a few sprouts, however, so new plants cannot be propagated this way economically in the large numbers needed for a commercial crop.

For this reason, most growers must use seedlings, which are more easily obtained but slower to start producing. Moreover, seedlings always contain from 5 to 60% poor types. (Seedlings from the seed of selfed cultivars yield the lowest percentage of poor types.)

Commercial production is also hampered by the long time needed to bring bushes into full production.

Dr. R. E. Harris a special crop scientist at the CDA Research Station at Beaverlodge, Alta. Has recently transferred to the CDA Research Station at Sidney, B.C.

Under good conditions, bushes will start producing in three years but will not achieve profitable yields until seven years.

If conditions are not good, production will be delayed. Growers can increase the percentage of bushes established and improve yields in the early years of production by irrigating during dry periods and by applying nitrogen and phosphorus fertilizers.

We still know very little about the correct management of saskatoons. Pruning, fertilizing and irrigating seem to help increase yield, quality, uniformity of ripening, and even the ease with which the crop can be picked. We know nothing about chemical weed control in saskatoons.

You might wonder if late spring frosts would be a problem in the Peace River region but they usually cause serious crop losses only once every 15 to 20 years. The few insects and diseases that are troublesome can be controlled by single applications of spray at the early and late blossom stages.

Although *Amelanchier* is being developed as a fruit crop, it is already established as an ornamental. It can be obtained in bushes that grow from 2 to 15 ft (0.6 to 4.5 m) tall in shapes varying from a compact globe through upright-spreading to columnar. All produce an abundance of cream flowers in spring, and cream, pink, or blue-black fruit in summer. Some genotypes are particularly attractive in the fall when the green foliage turns to dark purple, red, yellow, and brown.

Saskatoons are native to Canada – they are found from Vancouver Island to Newfoundland, and from our southern border to as far north as Fort Wrigley, N.W.T. and Dawson City, Yukon, Before the pioneers arrived, Indians were eating the fresh and dried fruit and using it in pemmican. Saskatoons were sometimes the only fruit available to the the early Prairie settlers. Many birds also enjoy the fruit and buds.

Over the years Canadians have developed most of the improved cultivars grown for fruit, as hedges, and as ornamentals. Now Canadians may be the first to produce the fruit commercially.

With this record, we might well name saskatoons our national fruit. ■

A 10-year-old row of saskatoons bearing a heavy crop of fruit.

Fruit picked with vibrators contain some leaves and twigs These are easily removed in a cleaner.

ECHOES
FROM THE FIELD AND LAB

MILK PRODUCTION IMPROVING IN FRENCH SIMMENTAL Jack Stothart, Director, CDA Research Station, Lacombe, presented a paper on the results with French Simmental in Canada at a meeting of the European Simmental Federation held in Dijon, France, last November

The relative emphasis put on milk and beef with this breed varies a great deal in different countries. Most consider it a dual purpose breed although up until recently the emphasis was on milk. One race of the French Simmental, the Montbeliarde, has made excellent progress in recent years It is their milking strain and has increased in numbers almost tenfold in the last ten years. Average milk production of the Montbeliarde now exceeds that of the French Black and White (or French Friesian) in France, according to Mr. Stothart.

FASTER GRAIN FLOW C P. Rail and the Canadian Wheat Board have agreed to a computerized information exchange program to improve Canada's export grain shipping commitments. The railway will supply to the Canadian Wheat Board on a daily basis all information on grain loadings, grades, loading point, destination, and daily locaton of each freight car in transit.

The plan is to be in full operation by January 1, 1976 and it is hoped it will make it possible to make more efficient use of the port terminals and to speed up loading operations.

NEW FARM CENTRE OPENS IN P.E.I. This unique Farm Centre brings under one roof the administration of six commodity marketing boards, the P.E.I. Milk Commission, the Federation of Agriculture, and the Farm Labor Pool. And it is located on the CDA Research Station at Charlottetown, handy to existing federal and provincial agricultural services. Truly one-stop shopping for P.E.I. farmers!

The $700,000 centre, which opened last November, includes in addition an auditorium (Macdonald Stewart Hall) with a seating capacity of 200, two additional meeting rooms, and a resource and information centre The complex is owned and operated by the Farm Centre Association Incorporated, a corporation made up of the commodity boards and farm organizations that it houses

The 2½ acre site was made available on a long-term lease by Agriculture Canada

Production team near Peking, following the example set by the Tachia brigade, spend Sunday leveling a field to increase productivity.

CDA LIVESTOCK SCIENTIST IN CHINA J. W. G Nicholson of the CDA Research Station at Fredericton and H T Fredeen of the CDA Research Station at Lacombe recently spent two weeks in China as members of a Feed Grains Symposium sponsored by the Canadian International Grains Institute.

While there, they visited the red banner brigade at Tachia, about 250 miles southwest of Peking Thirty years ago, the brigade was a small group of 150 people living in caves without enough to eat and working for a few landlords.

They have rebuilt by hand ancient terraces, leveled hills, improved the irrigation systems, and increased the use of fertilizer. Production per area of land has increased to ten times what it used to be.

There is no doubt, says Dr. Nicholson, that China is much advanced over Canada in the area of soil leveling, drainage, water conservation, and soil erosion. Many of their systems are very old, but all have been improved and extended in recent years.

In spite of their accomplishments in land use and the development of multiple crop systems, Dr. Nicholson suggests that we would consider many of their practices out of date. Now the emphasis in agricultural development there is turning to increased mechanization and to improving the quality of the diet by increasing production of animal products.

RÉDUCTION DES PERTES HIVERNALES DANS LES LUZERNIÈRES DU QUÉBEC Québec compte plus 808 000 ha (2 000 000 acres) convenant à la culture de la luzerne, mais les luzernières occupaient une superficie inférieure à 121 200 ha (300 000 acres) en 1975. Pourquoi?

La luzerne subit de fortes pertes en hiver au Québec à cause de problèmes associés au sol, au climat, aux ravageurs et à une gestion inadéquate. M. H. Gasser, de la Station fédérale de recherche de Sainte-Foy (Québec) décrit ces problèmes et propose une approche organique à leur solution dans une communication présentée à la Première conférence sur l'amélioration des fourrages dans l'Est et à la 18ème Conférence sur l'amélioration de la luzerne dans l'Est qui se sont tenues à l'université de Guelph en juillet 1975.

Dans sa causerie, M Gasser a proposé les recherches qui s'imposent, et il a précisé des projets à court et à long terme. A court terme, il a laissé entendre qu'il nous faudrait en connaître davantage sur le rôle joué par le climat, les maladies et les ravageurs dans la réduction des peuplements et des rendements. A long terme, il a proposé d'étudier les mécanismes de la résistance au froid. Il a aussi insisté sur la nécessité d'un programme d'amélioration génétique où l'on consacrerait beaucoup d'efforts à la création de variétés tolérant mieux le gel et les maladies Finalement, il a recommandé à l'intention des agriculteurs un programme visant à favoriser la culture de la luzerne.

ECHOS
DES LABOS ET D'AILLEURS

AGRICULTURE CANADA CRÉE DES LIGNÉES DE MAÏS RÉSISTANTS À LA PYRALE La plupart des variétés de maïs à maturité assez précoce pour être cultivées au Québec et dans les provinces Maritimes sont exposées aux attaques de la pyrale. Une seule génération de ces insectes peut causer plus de dommages dans les régions précitées que dans d'autres où la pyrale compte deux générations par année.

Les chercheurs de la Station fédérale de recherche de Saint-Jean (Québec) essaient de créer des lignées de maïs hâtif qui seraient résistantes à la pyrale. MM. Marcel Hudon, entomologiste, et Morgan S Chiang, phytogénéticien, étudient des lignées auto-fécondées provenant de divers gouvernements, d'Instituts du maïs, d'universités, et de centres commerciaux de toutes les parties du monde.

Afin d'évaluer leur résistance à la pyrale, ils élèvent des pyrales par milliers dans leurs laboratoires. En juillet, les œufs produits en laboratoire sont déposés dans le verticile des feuilles de maïs cultivé dans des champs de la sous-station de l'Acadie.

Cette forte infestation artificielle est surveillée et on en évalue les dommages à de nombreux stades de développement du maïs. On compare ensuite les résultats à l'échelle internationale pour ne conserver que les lignées de maïs les plus résistantes

M. Hudon signale des résultats prometteurs. «Si les succès durent, dit-il, nous devrions obtenir d'ici quelques années des variétés hâtives de maïs résistant à la pyrale.» En attendant, il recommande les bonnes façons culturales car elles sont moins coûteuses que les produits chimiques dans la lutte contre les infestations de la pyrale et pour en réduire le nombre.

Un groupe d'entomologistes et de sélectionneurs du Canada et de l'étranger examinent des lignées expérimentales de maïs, à la Station de recherches de St-Jean, en fonction de leur résistance au pire ravageur du maïs, la pyrale. Article à l'intérieur.

SEED ANALYST Agriculture Canada's Plant Products Division operates laboratories in major centers across Canada to analyze seed for grading and enforcement purposes, and provide a seed testing service to the public. The laboratories at Montreal, Ottawa, Toronto, Winnipeg, and Edmonton are also authorized to issue International Seed Testing Association (I.S.T.A.) certificates of analysis for seed to be exported.

Seed for domestic use is tested in accordance with the Methods and Procedures for Seed Testing under the authority of the Seeds Act. While the seller is responsible for the grade claimed, the tests may be conducted by either an official, commercial, or private seed laboratory.

In addition to purity and germination tests in the laboratory, the Plant Products Division monitors varietal purity by growing seed samples in field plots in comparison wth standard samples of the variety. At the same time research is under way to develop techniques to evaluate varietal purity by chemical tests or by the study of cell and plant characteristics.

TRACKING THE QUEEN It wasn't easy to find a queen bee surrounded by thousands of workers in her beehive — until now.

Don Nelson, head of apiculture section at CDA Research Station, Beaverlodge, teamed up with Dr. W. F. Baldwin of Atomic Energy of Canada Limited, Chalk River, to work on the problem.

They designed a tiny piece of irradiated platinum-iridium wire, which is flattened to form a tag and glued to the thorax of the queen bee. The position of the queen in the hive can be detected from a distance of about 18 inches by using a geiger counter.

CDA researchers will continue to study the radioactive tags and plan to use them to track the movements of the queen during the winter to study her behavior.

ANALYSTE DES SEMENCES La Division des produits végétaux du ministère de l'Agriculture du Canada dispose dans les centres importants du Canada des laboratoires où sont analysées les semences pour fin de classement et de conformité au Règlement et offre au public un service d'essais de semences. Les laboratoires de Montréal, d'Ottawa, de Toronto, de Winnipeg et d'Edmonton peuvent également délivrer des certificats d'analyse de l'Association internationale d'essais de semences (ISTA) à l'égard des semences destinées à l'exportation.

Les semences utilisées au pays sont analysées conformément aux méthodes et modalités d'analyse prévues par la Loi sur les semences. Le détaillant rend compte de la catégorie fixée, mais les essais peuvent être effectuées dans un laboratoire fédéral, commercial ou privé.

Outre les essais de pureté et de germination en laboratoire, la Division des produits végétaux surveille la pureté variétale en cultivant des échantillons de semences en parcelles et les comparant aux échantillons standard de la variété. Parallèlement, des recherches visant la mise au point de techniques d'évaluation de la pureté variétale par analyse chimique ou par l'étude des caractéristiques des cellules et de la plante sont en cours

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